CHAPTER I

U.S. AIRLIFT:

REQUIREMENTS VERSUS CAPABILITY

To meet its worldwide security commitments, the United States needs strategic mobility--namely, the ability to move military forces rapidly from their U.S. bases to potential trouble spots around the world and to support these forces once they are deployed. The Air Force and the Navy provide mobility forces, primarily to support the Army and the Marines. Resources to buy transport aircraft and ships, however, must compete directly with resources for modern combat aircraft and ships. When resources were limited, as they were in the 1970s, funds for strategic mobility became especially scarce. Indeed, until the fiscal year 1983 budget, strategic mobility had not fared at all well in competing with other military missions for available budgetary resources.

As a result, in recent years a general consensus developed that the United States lacked the means to deploy large numbers of combat forces rapidly. During World War II, Korea, and Vietnam, over 95 percent of U.S. forces and supplies moved by sea. But the U.S.-flag dry cargo fleet has declined from over 600 ships in 1970 to about 265 in 1983. 1/ This number represents a decline in total ship tonnage of about 50 percent.

At the same time as this decline was taking place, the United States was identifying new parts of the world that it viewed as critical to its national interests. In addition to its long-standing commitments to the defense of Europe and its allies in the Far East, the United States was assuming additional security responsibilities in Southwest Asia and Latin America. In light of these new commitments, the Congress believed a growing imbalance was developing between defense requirements and capability for strategic mobility. For example, in 1980 when President Carter announced the Carter Doctrine committing the United States to protect the Persian Gulf with military forces if necessary, the United States had sufficient airlift to deploy only about a third of the equipment and material that the military believed would be needed to repulse a threat to the Gulf States' oil fields.

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1. Strategic Sealift Division, Office of the Chief of Naval Operations, *Strategic Sealift Program Information* (Washington, D.C.: Department of the Navy, April 1985), p. 12.

MEETING MOBILITY REQUIREMENTS AND GOALS

Over the past years, serious concerns about U.S. mobility have prompted a series of studies and actions. In 1981, at the request of the Congress, the Department of Defense (DoD) performed an analysis of mobility requirements and current capabilities--the *Congressionally Mandated Mobility Study* (CMMS). 2/ This study looked at mobility requirements for a number of contingencies, including a major conflict in Southwest Asia and the rapid reinforcement of NATO in the event of war in Europe. As a result of the study, the Department of Defense recommended increasing U.S. mobility by adding to all three means of mobility: airlift capability, sealift capability, and prepositioning of equipment and supplies where they might be needed.

These three methods, however, do not contribute equally to mobility. Sealift would continue to provide about 95 percent of all mobility necessary for the bulk of equipment and to sustain forces in any future major conflict. But ships are slow, requiring two to four weeks to make deliveries, depending on the destination. Therefore, they cannot provide the prompt response that might be necessary in many possible situations. While prepositioning of equipment and supplies, either on land or in special ships, can speed deployment, it limits flexibility by committing forces to certain theaters and requires buying duplicate sets of equipment for forces.

Airlift remains the most flexible and responsive way to provide the mobility that would be needed for immediate wartime response. Transport aircraft can deliver forces quickly anywhere in the world. But airlift is expensive; each C-17 will cost $142 million. Moreover, it would take nearly 230 C-17 sorties to move the same amount of cargo that a single $200 million ship can carry. Military planners, therefore, have never considered buying an airlift fleet to handle more than a small fraction of U.S. mobility needs. Hence, requirements for airlift to distant areas such as Southwest Asia are calculated based on the need to deploy relatively light Army and Marine units--together with supporting tactical aircraft and air defense systems--to slow enemy advances, seize strongpoints and airfields, and establish beachheads. This deployment of light units would allow time for heavier units and supplies to arrive by sea. In the event of a European conflict, airlift would transport troops and essential equipment to augment forward deployed and prepositioned forces.

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2. Department of Defense, *Congressionally Mandated Mobility Study* (U), SECRET (Washington, D.C.: DoD, 1981).

The CMMS study found that U.S. airlift capability was far from adequate to meet the requirements of a major conflict in either Europe or Southwest Asia. The study recommended that the United States more than double the capability of its 1981 airlift fleet, raising the capability from about 27 million ton-miles per day (MTM/D) to a goal of 66 MTM/D. 3/ The Department of Defense (DoD) adopted this goal, and the oversight committees of the Congress generally accepted it as the target for efforts to improve airlift. Nevertheless, the military services do not believe this goal of 66 MTM/D would meet the full requirements for airlift in a major conflict involving the Soviet Union; instead, they claim, the figure is a compromise between meeting requirements fully and holding down costs.

RECENT IMPROVEMENTS AND FUTURE PLANS IN AIRLIFT

As a step toward meeting the 66 MTM/D goal, the Administration proposed a near-term airlift improvement program in the 1983 budget. The program included the acquisition of 50 C-5B and 44 KC-10A aircraft; it also called for enhancing the Civil Reserve Air Fleet (CRAF)--commercial aircraft that have been modified so they can be converted rapidly to military cargo operations in an emergency. In 1983, the Air Force estimated that the addition of these new aircraft, coupled with higher levels of support for existing aircraft, would increase airlift capability to 48.5 MTM/D--or about three-fourths of the long-term goal--by 1988 (see Figure 1). 4/

Airlift Master Plan

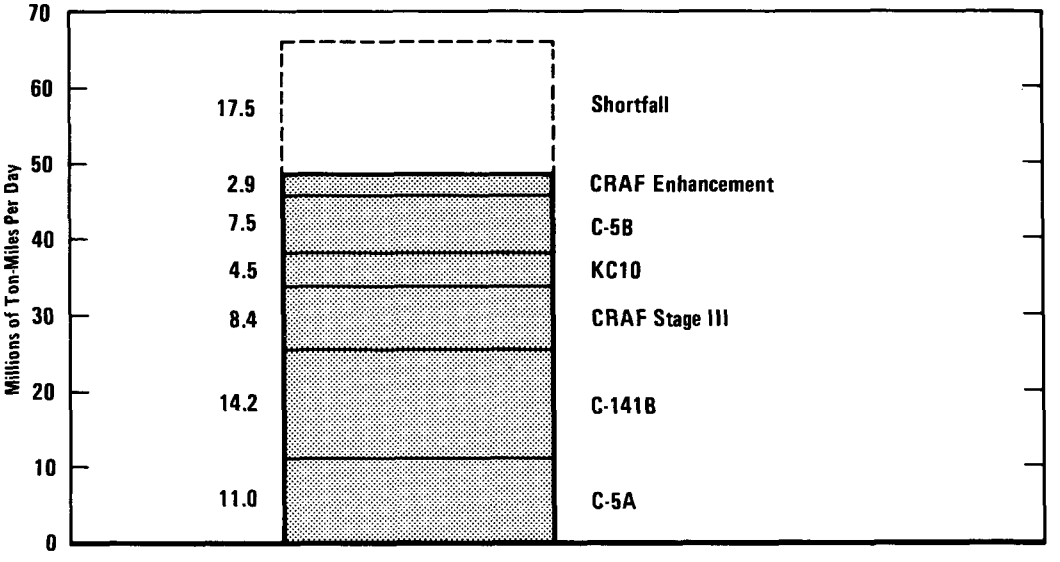
Before deciding how to meet the remainder of the goal, the Congress directed the Air Force to develop a plan for employing existing aircraft and to evaluate alternatives for increasing airlift capability. The *Airlift Master Plan,* released in 1983, was the Air Force's response. 5/ The plan specifically revalidated the Air Force's choice of the C-17--a new, large transport aircraft designed by the McDonnell Douglas Corporation--as the next-generation of strategic airlifter. The Air Force had originally selected the

3. Ton-miles per day is a common measure that reflects the amount of cargo to be moved, the distance it must travel, and the time period required to complete the deployment. Capability of the airlift fleet (in ton-miles per day) is calculated based on the payload, speed, and utilization rate for each type of aircraft and the number of aircraft available.

4. Revisions of wartime planning factors reduce the Air Force's estimate of capability provided by the near-term program to 45.4 MTM/D by 1989.

5. Department of the Air Force, *Airlift Master Plan* (September 1983).

Figure 1.
Fiscal Year 1989 Airlift Capability



SOURCE: Department of the Air Force, *Airlift Master Plan* (September 1983), p. III-13.

C-17 in 1981 as the eventual replacement for the C-141B aircraft, which was built between 1964 and 1968 and today represents the majority of aircraft in the military airlift fleet.

While strongly supported by the Administration, the Air Force's plan to acquire 210 C-17s has been criticized. 6/ For one thing, it will be an expensive aircraft; total procurement, research and development, and military construction costs will amount to $30 billion, or about $142 million per plane. Furthermore, because the C-17 is a new aircraft that has never been produced, procurement will take many years. In fact, the goal of 66 MTM/D of strategic airlift capability will not be achieved until the year 2000, about 20 years after the need for it was established.

STRATEGIC AND TACTICAL AIRCRAFT CHOICES

The Congress could elect not to continue the C-17 program and, instead, pursue other improvements in airlift or mobility. For example, the goal of

6. Jeffrey Record, "U.S. Strategic Airlift: Requirements and Capabilities," *National Security Paper: 2* (Washington, D.C.: Institute for Foreign Policy Analysis, 1986) and Kim R. Holmes, "Closing the Military Airlift Gap" (Washington, D.C.: Heritage Foundation, 1986).

66 MTM/D could be achieved more quickly, and at a comparable cost, by buying aircraft now in production, such as the C-5 or KC-10, rather than a newly designed plane. Other analysts have noted that maritime prepositioning, while not as responsive as airlift, is dramatically cheaper.

Each of these possible choices has advantages and disadvantages. The Administration believes the C-17 to be the best choice. Yet, the Administration's plan involves important changes in force structure involving other airlift aircraft and derives much of its savings from these aircraft.

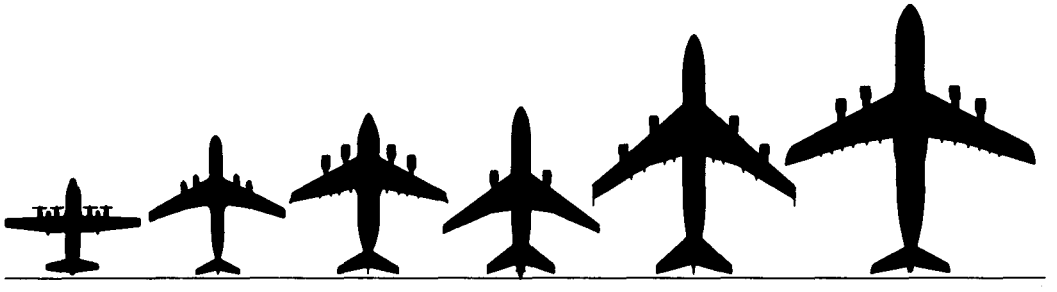
To provide a better understanding of these options, the following paragraphs offer brief descriptions of the C-17 and other major aircraft in the U.S. airlift fleet. (See Figure 2. For a more detailed overview, the reader should also consult Appendix A.)

McDonnell Douglas C-17

The C-17 aircraft has been designed to fill both strategic and tactical airlift roles. It will be capable of delivering major equipment directly from U.S. bases to forward areas, thus offering the potential of eliminating the time-consuming transshipment stage.

In its strategic airlift role, the C-17 will be able to transport "outsize" pieces of equipment, such as the M1 tank or the Bradley Fighting Vehicle, over intercontinental distances. Today, only the Lockheed C-5 Galaxy

Figure 2.
U.S. Airlift Aircraft



SOURCE: Department of the Air Force.

(described below) has the ability to move these items. The C-17 will also be able to carry relatively smaller equipment, such as towed howitzers or trucks (referred to as "oversize" equipment), as well as bulk cargo, such as rations or ammunition.

In its tactical airlift role, the C-17's design incorporates special military capabilities such as the low altitude parachute extraction system--which allows cargo to be extracted from the aircraft without the aircraft actually landing--and the combat offload technique--which allows the cargo aboard the aircraft to be unloaded without the aircraft coming to a full stop after it lands.

At its present stage of development, the C-17 aircraft appears capable of meeting (and in some cases, exceeding) its design requirements. In addition, the manufacturer will guarantee many of the aircraft specifications, such as the reliability and maintainability standards, the structural integrity of the airframe and components, and the takeoff and landing performance. The C-17 also requires a minimal crew--pilot, copilot, and loadmaster. But such capabilities are not purchased cheaply. The total cost of each C-17 is currently estimated to average $142 million.

Lockheed C-5B Galaxy

One alternative for the Congress is to continue buying the C-5B. The largest aircraft operated by the Military Airlift Command (MAC), it has somewhat greater intertheater capability than the C-17 but, according to the Air Force, is more limited in the intratheater role. Like the C-17, it can carry such outsize cargo as tanks. Indeed, one C-5 can transport two M1 tanks (the C-17 can carry only one) or six Bradley Fighting Vehicles.

Seventy-seven of the C-5A aircraft, built between 1969 and 1973, remain in service with MAC. Acquisition of an additional 50 C-5B aircraft, which was authorized in 1982, will be completed in 1989. The 50 C-5Bs currently being procured cost an average of $168 million each (in 1987 budget year dollars). The Lockheed Corporation in January 1986 offered to sell the Air Force 24 additional aircraft at an average flyaway price of $90 million (in constant 1984 dollars). Based on this offer, CBO estimates that the unit program cost for the C-5, including initial spares and other support equipment, would be about $125 million (in 1987 budget year dollars).

McDonnell Douglas KC-10A Cargo/Tanker Aircraft

Another alternative currently available is the KC-10A. The KC-10A is a military version of the commercial DC-10 aircraft. It is a three-engine

widebodied transport that can be operated either as a tanker for aerial refueling or as a cargo aircraft. Currently, all KC-10s are operated by the Strategic Air Command as tankers.

The KC-10A cannot carry outsize equipment such as tanks and helicopters. Moreover, the cargo door, which is high on the side of the aircraft, limits its usefulness as a military transport, since specialized unloading equipment is required at the destination. Thus, the KC-10s are best suited to hauling bulk and certain oversize cargo to main operating bases. In this role, however, the aircraft is effective; it can transport up to 170,000 pounds of cargo (or 27 standard military pallets) up to 3,800 nautical miles. The KC-10As being acquired in 1987 cost about $63 million each, considerably less than the C-17 or the C-5B.

Civil Reserve Air Fleet Aircraft

Yet another approach to meeting airlift needs would emphasize increasing the size of the Civil Reserve Air Fleet (CRAF). In an emergency, commercial aircraft operated by carriers that belong to the CRAF would be available to transport military cargo. 7/ These aircraft include all-cargo or cargo-convertible versions of the Boeing 707 and 747, and the McDonnell Douglas DC-8 and DC-10. 8/ The Administration's CRAF Enhancement Program is currently adding 19 wide-bodied aircraft to the CRAF cargo fleet by paying for modifications to allow passenger aircraft to be converted rapidly to cargo operation.

While CRAF aircraft would be critically needed in a major war as carriers of bulk material and people, their capabilities are seriously limited. To be carried by these aircraft, equipment must be loaded on pallets. None of the aircraft can carry outsize cargo, and only the 747 and the DC-10 can carry oversize cargo. Also, none of these CRAF aircraft is air-refuelable. Thus, their operation to remote areas could be restricted by another country's refusal of landing or overflight rights.

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7. The CRAF program also includes over 200 commercial passenger aircraft that would be used to transport troops to combat theaters.

8. These aircraft are capable of long-distance international cargo missions. Other aircraft, such as the Boeing 727 and 737 and the McDonnell Douglas DC-9, also belong to the CRAF cargo program and would be used for domestic or short-distance international missions in an emergency.

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CHAPTER II

THE ADMINISTRATION'S PLAN FOR AIRLIFT IMPROVEMENTS

To meet the goal of 66 million ton-miles per day (MTM/D) of intertheater airlift capability, the Administration plans a significant expansion of its airlift forces. It intends to finish developing and buy 210 new C-17 aircraft over the 1988-1998 period, at a cost of $29.3 billion. In addition to acquiring the C-17, the Administration intends to make a number of other significant changes in force structure that would affect the active and reserve forces as well as the cost of the airlift program.

PLANNED CHANGES IN FORCE STRUCTURE

As a result of the near-term airlift improvement program approved by the Congress in 1983, the Air Force's strategic airlift forces will, by 1989, include 66 C-5As, 44 C-5Bs, 57 KC-10As, and 234 C-141Bs (see Table 1). 1/ In addition, some 500 C-130 tactical airlifters are now available in active, Air National Guard, and Air Force Reserve squadrons.

Changes in Aircraft

To arrive at the planned force structure for the year 2000, the Administration contemplates major changes in airlift forces. Although it plans no further purchases of C-5Bs or KC-10s after 1987, it will add 180 new C-17s to the force structure by the year 2000. 2/ These C-17s will serve as the backbone of the military airlift operating fleet, replacing the C-141 in that role by the end of the next decade. Fifty-four older C-141s will be retired,

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1. These counts are based on primary aircraft authorized (PAA), and exclude backup and trainer aircraft. From the total force of 77 C-5A aircraft, for example, it is estimated that 66 will be available at any given time to perform the airlift mission. The Air Force determines the total number of aircraft to be acquired based on the number necessary to support primary missions and those necessary for training and backup inventory.

2. Of the 210 aircraft, 30 are for training and backup inventory. Thus, the number of primary aircraft available to perform airlift missions is 180.

TABLE 1. ADMINISTRATION'S AIRLIFT PLAN (In terms of primary aircraft authorized)

	Fiscal Year 1989 Forces			Planned Force Structure Changes, 1989-2000		Fiscal Year 2000 Forces		
	Active	Reserve	Total	Add or Retire	Transfer to Reserves	Active	Reserve	Total
Strategic Airlifters								
C-5A/B	70	40	110	0	0	70	40	110
C-141B	218	16	234	-54	64	100	80	180
KC-10	57	0	57	0	0	57	0	57
C-17	0	0	0	180	48	132	48	180
Total	345	56	401	126	112	359	168	527
Tactical Airlifters								
C-130A/B/E/H	202	300	502	-160 a/	0	190	152	342
Total Aircraft	547	356	903	-34	112	549	320	869

SOURCE: Department of the Air Force, *Airlift Total Force Plan* (Washington, D.C.: Department of the Air Force, September 1984); supplementary data also supplied by the Department of the Air Force.

NOTE: All data are for primary aircraft authorized and exclude trainer and backup aircraft.

a. Approximately 20 of the total planned 180 C-130 retirements will have been made by 1989.

and the peacetime operating rate of the remaining 180 of these aircraft will be reduced by 50 percent.

This reduction in peacetime operations of the C-141s will be achieved by assigning only two crews per plane versus the current four crews. It will also allow the C-141 aircraft to continue in the force until about the year 2010 without exceeding their 45,000 flying hour estimated service life. Thus, by the year 2000, the strategic airlift force would gain 180 new and more capable aircraft, lose 54 considerably older and less capable aircraft, and thereby have a net increase in airlift capability of 36 percent.

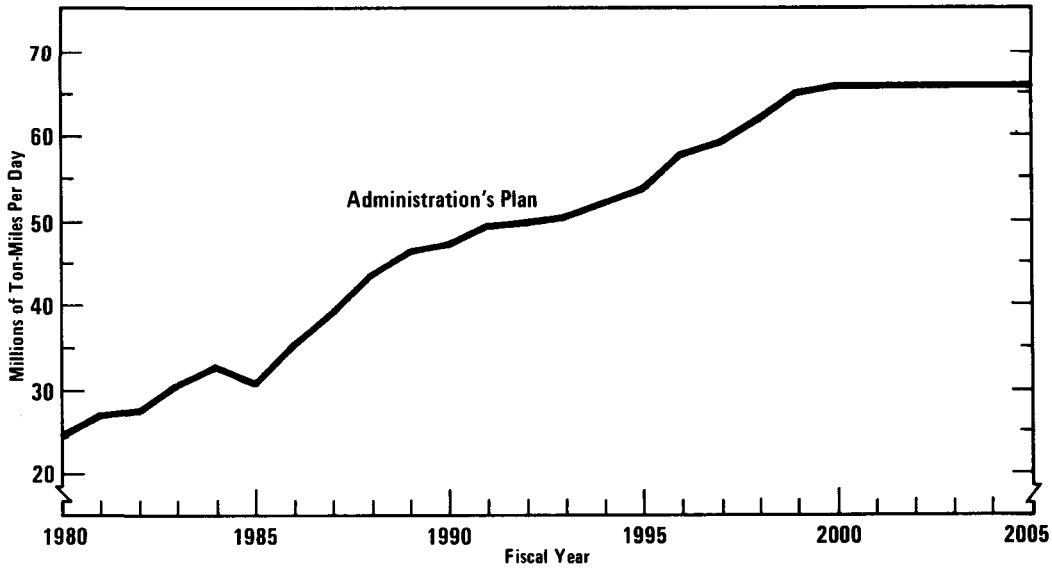
In addition, the Administration's plan would reduce the number of tactical aircraft, which are designed to carry cargo over relatively short distances within a given combat theater. The Administration plans to retire 180 of the oldest C-130 tactical airlifters, which are considerably less capable and more expensive to maintain than the newer C-130E and C-130H models. The retirement of these airlifters would reduce the C-130 fleet by about one-third, to 324 aircraft. According to the Administration, this loss in tactical airlift capability would be offset by the ability of the C-17 to deliver equipment directly to forward operating areas, thereby helping to meet tactical airlift requirements. Other analysts have noted, however, that having a fewer number of tactical aircraft may limit the flexibility of theater commanders.

Transfer of Equipment and Missions to the Reserve Forces

Traditionally, airlift squadrons in the part-time air reserve forces (the Air National Guard and Air Force Reserve) have had only tactical aircraft--primarily C-130s, as well as smaller numbers of other aircraft. The planned one-third reduction in C-130 forces would eliminate many tactical squadrons, mostly those manned by reservists.

To offset the reduction, the Air Force has initiated a program of transferring aircraft to the reserve forces, who will assume new responsibilities for strategic airlift. Forty (PAA) C-5A aircraft will be transferred by 1989, as will 16 (of an eventual 80) C-141B aircraft. In addition, 48 of the 180 (PAA) C-17s will go directly to air reserve forces, so that by the year 2000 all three types of strategic airlifters will be present in the reserve forces' inventory. Reserve associate squadrons, in which reservists share responsibility for operating and maintaining equipment belonging to an active squadron, will continue to share equipment with active C-5 and KC-10 squadrons, and some C-17 squadrons. These shifts affect both capability and costs.

Figure 3.
Intertheater Airlift Capability: The Administration's Plan



SOURCES: Congressional Budget Office (for 1987-2005 projections); Department of the Air Force (for 1980-1986 data).

Quantitative Improvements in Airlift Capability

The Administration's plan will generate a gradual improvement in airlift capability, probably reaching the 66 MTM/D goal for intertheater airlift by the year 2000 (see Figure 3). The Air Force, however, is modifying some of the factors that determine estimates of airlift capability, and such changes could alter these results. In addition to increasing intertheater capability, the Administration's plan will also improve intratheater or tactical airlift capability.

Improvements in Capability

The Air Force currently estimates intertheater airlift capability to be about 35 MTM/D. By 1989, when all the C-5Bs and KC-10s will have been delivered, capability will increase to 48.5 MTM/D. 3/ The 180 new C-17s would add 27.4 MTM/D of intertheater capability to this base, which would actually raise capability to some 76 MTM/D if other changes were not planned.

3. The estimate of 48.5 MTM/D is based on a 12.5 hours per day utilization rate for military airlifters and 10 hours per day for CRAF aircraft.

The Administration's plan to retire the 54 C-141B aircraft, together with the 50 percent reduction in crews for the remaining 180 C-141B aircraft, will reduce the contribution of these aircraft to total airlift capability by about 10 MTM/D. Thus, the net gain just meets the 66 MTM/D goal.

Uncertainties in Intertheater Estimates. The 66 MTM/D is an estimate that depends on numerous planning factors. The Air Force is currently modifying those factors in ways that mean that the Administration's plan may not fully meet the 66 MTM/D goal.

Actual wartime airlift capability is uncertain. As is often true of wartime planning, estimates depend on a combination of facts and assumptions. Planners distinguish between "surge capability"--the amount of airlift a force can generate during the initial days of intense mobilization activity --and "sustained capability"--the amount of airlift activity sustainable in the longer term. The 66 MTM/D goal is for surge capability, which includes the major deployment of units and their equipment from the United States to combat theaters. Surge capability is higher than sustained capability because planners assume that both machines and their crews can operate at higher rates for a short period by deferring routine maintenance and crew time-off until the emergency is past. The focus of this study is on surge capability, which is the critical factor for airlift planning.

Capability estimates for an aircraft depend on a number of factors, including:

- Cargo capacity (floor space, volume, and weight);
- Mix of cargo being carried, whether it is dense cargo (like ammunition) or relatively light equipment requiring a large floor area;
- Speed of the aircraft;
- Utilization rate (a fleetwide average of the number of flying hours per day it can generate);
- Availability of spare parts and maintenance facilities; and
- Number of flight crews assigned per plane.

The first four factors--size, cargo mix, speed, and utilization rate--are usually combined to determine the highest feasible aircraft productivity in ton-

miles per day. Thus, a C-5B carrying an average of 69 tons at a speed of 423 nautical miles per hour and flying 12.5 hours per day generates 171,000 ton-miles per day of capability. The 12.5 hours per day is labeled the "objective rate" and is the figure used for force planning. This rate would be reduced if the supply of spare parts was inadequate to sustain it, if maintenance personnel or facilities were limited, or if the number of trained flight crews were insufficient. For example, four separate crews, or a total of 26 personnel, are estimated to be needed per C-5B to maintain operations at the 12.5 hours per day rate during the surge period.

The most controversial factor in estimating capability is the wartime objective utilization rate--the number of hours per day the aircraft can fly. Before 1974, the rate was simply set at 10 hours per day for planning purposes, and the requirements for crew, maintenance, and parts were computed based on that assumption. In 1974, Secretary of Defense Schlesinger directed the Air Force to raise the rate to 12.5 hours per day, thereby raising total airlift capability by 25 percent without buying one new aircraft. As a result, crews and maintenance personnel had to be increased to sustain the higher figure. Utilization rates for the C-5A/B, the C-141, and the KC-10 in this study, as well as the Air Force's *Airlift Master Plan*, adopt this figure of 12.5 hours per day.

The productivity of the C-17, however, is calculated by the Air Force based on an average rate of 15.65 hours per day of operation. The Air Force bases this higher rate on the low maintenance man-hours per flight hour specified in the C-17 contract. It also believes that special features of the new aircraft--such as its advanced thrust reverser, which allows the plane to unload in a crowded area--will expedite loading and unloading the aircraft, thereby limiting time spent on the ground.

While this productivity rate is higher than any previous rate used by the Air Force in airlift planning, the 15.65 figure is comparable to the best rates achieved by some commercial airlines in long-haul cargo operations. 4/ It is uncertain, however, whether this rate could be achieved under wartime conditions, and to what extent it would be reduced by making deliveries to forward areas.

The Air Force and the Department of Defense have performed analytic simulations of deployment, based on the actual units and cargo loads that would be delivered by air in a crisis. These studies suggest that the objec-

4. During the Vietnam War, several commercial carriers achieved such rates not just for a month but for over a year of operations. This information is based on airline operating statistics compiled by the McDonnell Douglas Corporation.

tive rates used for both the C-17 and other aircraft might be too high. In fact, in part because of these findings, the Air Force has already lowered its objective rate for the C-5 from 12.5 to 11.0 hours per day. In its forthcoming review of airlift needs, the Air Force may also reduce the planned utilization rate for the C-17.

Reductions in utilization rates will mean that, in the absence of any offsetting changes, the Administration's plan will not meet the goal of 66 MTM/D. Eventually, that could mean that the Air Force will need to procure more than 210 C-17 aircraft. On the other hand, other changes in factors could offset these reductions in utilization rates. Changes in utilization rates could also alter the relative effectiveness of the C-17 when compared with alternatives like the C-5. (See Chapter III for a discussion of these issues.)

Uncertainties in Intratheater Capability. The current tactical airlift fleet is capable of delivering some 9,000 tons of cargo per day, according to assumptions used in the *Airlift Master Plan*. Retiring 180 C-130s without replacing them would reduce this figure by one-third. The Administration, however, argues that the direct-delivery capability of the C-17--the ability to deliver cargo to small airfields--will effectively raise total intratheater airlift capability to 16,000 tons per day. 5/

Calculations leading to this figure, however, are questionable. In particular, when calculating the C-17's intratheater capability, the Air Force assumes the same tonnage as for intertheater missions. This assumption, however, may overstate its contribution, since much of the C-17's cargo space might be wasted in tactical missions. Combat experience in Vietnam suggests that tactical airlift missions involved relatively small, though high priority, payloads. On the other hand, one can argue that, since no aircraft with the C-17's combination of payload and performance was available in Vietnam, generalizations from that experience are of limited value in planning for the use of tactical airlifters in the event of any future conflicts.

Qualitative Improvements

The C-17 would also provide qualitative improvements that the Air Force believes are as important as its quantitative contributions. As was noted in Chapter I, the C-17 combines the heavy lift capability of a long-range transport with a tactical ability to deliver cargo to forward areas. It also

5. Department of the Air Force, *Airlift Master Plan*, p. V-9.

needs only a minimal crew and, assuming the aircraft performs to specifications, will achieve better reliability and require less maintenance than existing strategic airlift aircraft.

COSTS OF THE C-17 PROGRAM

The C-17 program requires careful consideration of both near-term and long-term costs.

Near-Term Costs

Funding for the C-17 in the five-year defense program is substantial. Over the next five years, the Administration expects to request $10.1 billion in constant 1987 budget dollars (see Table 2). This total includes $2.9 billion for continued development and testing of the aircraft and $7.1 billion to procure the first 22 aircraft, starting in 1988. Also, CBO estimates about $0.1 billion will be required to add four aircraft to the CRAF program.

This spending, about $2 billion to $3 billion per year, would continue the higher level of support for airlift begun in 1983 with Congressional approval of the near-term airlift improvement program. The funds for airlift in the 1987 budget request, for example, are $2.9 billion, of which $2 billion is to complete the C-5B program, $0.1 billion is the final payment on the KC-10 acquisition, and the remaining $0.8 billion is for long-lead procurement and continued development of the C-17.

Total Program and Unit Costs

Near-term costs are only part of the C-17 financial story. The cost to complete the C-17 program is currently estimated at $29.3 billion (see Table 2). Total program costs are $29.9 billion or $142 million for each aircraft. Moreover, the Air Force estimates that flyaway cost (which excludes research and development funds, initial spares, training equipment, ground support equipment, and other nonaircraft costs) will average $103 million per plane. This latter figure compares with current flyaway costs of $63 million for the KC-10 and $108 million for the C-5B.

Long-Term Costs of the Administration's Plan

Although near-term costs are important, long-term costs cannot be ignored when considering airlift. After all, aircraft procured today will probably

TABLE 2. THE C-17 AIRLIFT PROGRAM: ACQUISITION COSTS
(By fiscal year, in billions of 1987 budget year dollars)

Category	1987	1988	1989	1990	1991	Total 1987-1991	To Complete	Total Program
Research and Development	0.6	0.9	0.7	0.4	0.3	2.9	0.3	3.2
Procurement	0.2	1.3	1.2	1.8	2.5	7.1	18.8	25.9
Total Cost	0.8	2.2	1.9	2.2	2.8	10.0	19.3 a/	29.3 a/

SOURCE: Congressional Budget Office from Department of Defense Selected Acquisition Reports.

a. Includes $158 million in military construction costs not shown separately. Excludes about $660 million for research and development done before 1987.

still be operating 30 to 40 years from now. Long-term costs of people, repairs, and daily operations are greater than acquisition costs. Indeed, according to the Air Force, operating savings would more than offset the high initial price paid for the C-17.

Defining Life-Cycle Costs. CBO based its long-term cost comparisons on total life-cycle costs, which combine acquisition and operating costs for the entire airlift fleet over the next 30 years. Acquisition costs for the various aircraft have already been noted. There are, however, numerous issues regarding operating and support costs.

Operation and support (O&S) costs per aircraft are the costs attributed to maintaining a squadron of each type of aircraft in peacetime divided by the squadron size. 6/ They include the pay for all military and civilian personnel assigned to the squadron, maintenance and repair costs (including depot maintenance as well as on-base maintenance), spare parts, and the cost of fuel for flying operations. The costs for military and civilian benefits, including accrual of retired pay, are added to direct military pay. Personnel costs for an airlift squadron include all people assigned to the squadron, including staff, security, and medical personnel, but they do not include any allocation of costs for higher administrative levels, such as Wing Headquarters, Headquarters, Military Airlift Command (MAC), or Headquarters, U.S. Air Force.

There is no single operation and support cost for an aircraft. One key determining factor is pace of operations--that is, the number of hours per day the aircraft is flown. A higher flying hour program costs more, not simply because of higher fuel consumption, but also because it requires more spare parts and more maintenance to support it. Figure 4 shows the relationship between flying hours and O&S costs for several aircraft.

Flying hours and resulting O&S costs chosen for this study are shown in Table 3. Two points deserve mention--the relatively low flying hours for

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6. The data on O&S costs were supplied by Military Airlift Command (MAC). They were estimated using the Cost Oriented Resource Estimating (CORE) model, a standard model used by the Air Force for costing forces. In the case of aircraft currently in the airlift fleet--such as the C-5A, KC-10A, and C-141B--model parameters (including fuel consumption per flying hour, maintenance personnel, spare parts requirements, and squadron personnel) were set based on actual MAC experience and current policies for the use of these aircraft in peacetime. In the case of the C-17, these parameters were set based on engineering estimates and contractual warranties made by the manufacturer and on the Air Force's plans for using these aircraft.